

# Three new species of *Humboldtiana* (Gastropoda: Pulmonata: Humboldtianidae) from Mexico

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## ABSTRACT

Three new species of *Humboldtiana* from the states of Hidalgo, Nuevo León and Sonora, Mexico are described. By the combination of internal and external morphological features two belong to the *Humboldtiana buffoniana* species group and one belongs to the *Gymnopallax* subgenus.

*Additional keywords:* Taxonomy, land snail, pulmonate, neotropical region

## INTRODUCTION

*Humboldtiana* comprises approximately 50 species distributed from South Texas to Central Mexico. Low vagility and dispersal abilities are reflected in high levels of endemism and highly restricted distributions (Thompson and Brewer, 2000). The genus is characterized by the presence of four dart sacs surrounding the vagina (each one bearing two dart bulbs); four dart glands form a ring around the vagina, the spermathecal duct with a caecum in the distal end; the penis containing a verge and flagellum moderately long. Variations to this general pattern have led to the proposal of six subgenera: *Polyomphala*, *Humboldtiana*, *Oreades*, *Gymnopallax*, *Clydonacme*, and *Aglotrochus* (Thompson and Brewer, 2000; Thompson, 2006), and three species groups within subgenus *Humboldtiana*: *H. buffoniana* group, *H. texana* group and *H. biciucta* group (Burch and Thompson, 1957; Thompson and Brewer, 2000). Repository institutions for type material are: CNMO, Colección Nacional de Moluscos, Instituto de Biología, UNAM, Mexico; DP, Colección Malacológica de la Subdirección de Laboratorios y Apoyo Académico del INAH, Mexico; UF, Florida Museum of Natural History, Gainesville, Florida. Description of the new species is based on the holotype and two paratypes; in all cases first

measurements are from the holotype and measurements in parentheses are from paratypes 1 and 2 respectively.

## SYSTEMATICS

Family Humboldtianidae Pilsbry, 1939

Genus *Humboldtiana* von Ihering, 1892

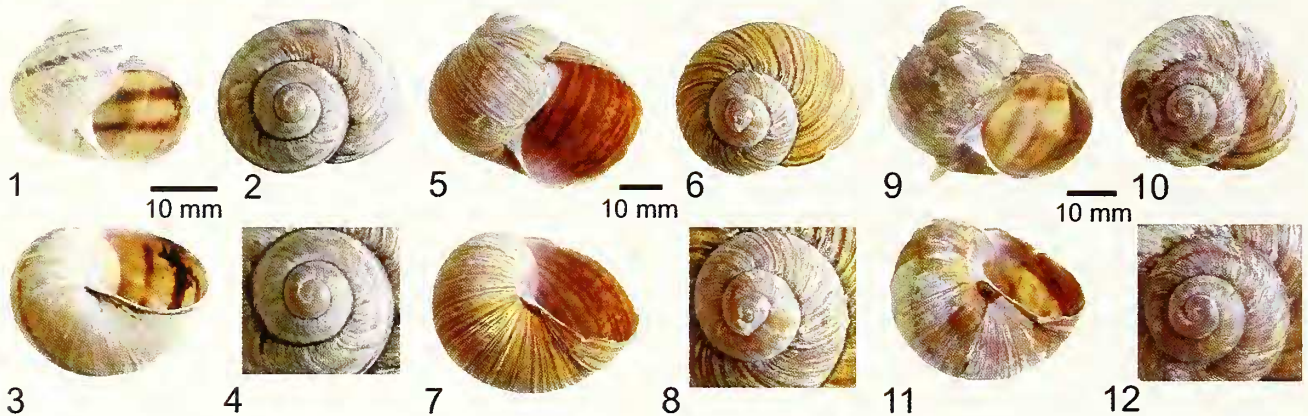
*Humboldtiana salviahispanica* new species  
(Figures 1–4, 13)

**Diagnosis:** A small *Humboldtiana*, with a pale brown shell bearing three chestnut to dark brown bands clearly visible on the internal surface of the shell. The subglobose shell and the glands just above dart sacs separate the new species from *H. edesma*, the only other species known to also have an almost indistinguishable atrium.

**Description:** SHELL (FIGURES 1–4): Shell globose, external lip slightly thickened, pale brown, with three chestnut to dark brown bands, second band wider than others, although in one specimen third is widest, 4.2 whorls (4.1, 4.1). Embryonic shell caramel in color, with 1.5 whorls (1.6, 1.5), first whorl without sculpture then with almost imperceptible growth lines, followed by well-marked growth lines. Sculpture of rest of shell constituted of white to pale-brown well-marked growth lines with almost uniformly distributed ovate granules. Umbilicus almost covered by aperture margin, granules faint in that area. Very thin, transparent callus. Shell height: 22 mm (25, 25); shell diameter: 26 mm (30, 29); aperture height: 17 mm (20, 18); aperture diameter: 17 mm (21, 17).

REPRODUCTIVE ANATOMY (FIGURE 13): Penis short and stocky, almost roundish below mid line, 7.8 mm (13.65, 11.8), interior of penis with two longitudinal folds, with large and broadened verge that cover entire penis cavity, verge composed of two large triangular lobes attached to penis wall by two rounded, smaller (half as big as larger lobes) lobes located at end of penis. Penis retractor

<sup>†</sup> *In absentia.*



**Figures 1–12.** **Figures 1–4.** *Humboldtiana salviahispanica* new species, holotype, DP 691. **Figures 5–8.** *Humboldtiana thompsoni* new species, holotype, DP 692. **Figures 9–12.** *Humboldtiana ootamorum* new species, holotype, CNMO 1188.

muscle 6.8 mm (6.45, 16). Epiphallus long, cylindrical, measuring 16 mm (21, 11.5). Atrium very short, almost indistinguishable, measuring 1.3 mm (1.5, 1.5). Vagina cylindrical, expanded to darts region, measuring 7 mm (10, 6), four dart sacs of approximately same size: ds<sub>1</sub>, 1.2 mm; ds<sub>2</sub>, 1 mm; ds<sub>3</sub>, 1.2 mm; ds<sub>4</sub>, 1.5 mm (1.7, 1.5, 1.5, 1.5) (1.8, 1.6, 1.8, 1.9). Glands form a complete ring just above dart sacs, maximum height 2 mm (2.6, 3). Spermathecal duct measuring 40 mm (64, 85); spermathecal caecum measuring 5 mm (7.2, 7.9); spermatheca adhering to albumen gland, enlarged, sac-shaped, measuring 7 mm (5.5, 6.3). Flagellum relatively short at 35 mm (42, 47), about 1.68 (1.48, 2.41) times the combined length of the penis + epiphallus.

**Type Material:** HOLOTYPE: DP 691; collected 29 June, 1995, by Ana B. Mancera and Gabriel Villegas Guzmán. PARATYPES: UF 376799 (1), CNMO 2731 (1); same data as the holotype. All from type locality.

**Type Locality:** HIDALGO: 4.1 km south and 6.8 km west of Huichapan, Hidalgo, 2290 m alt. (20°20'15"N, 99°42'45" W)

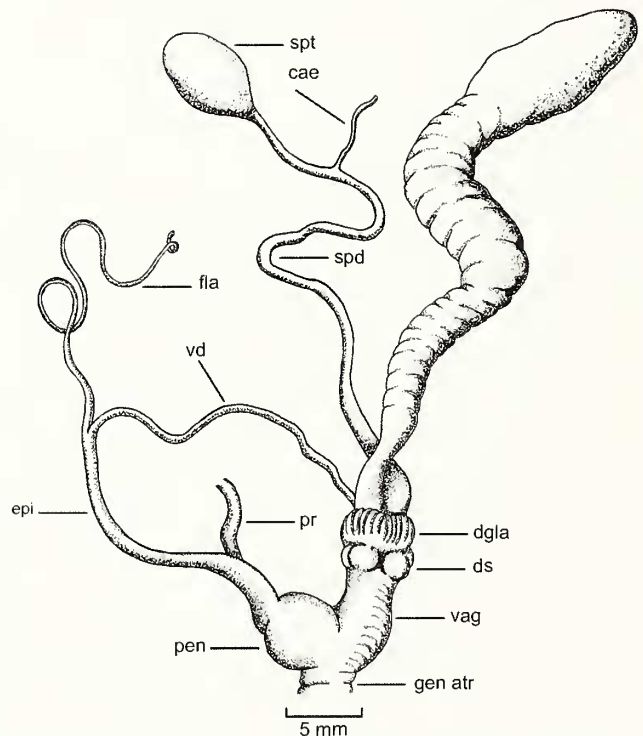
**Remarks:** This species belongs to the *H. buffoniana* species group, where glands are just above dart sacs. Short atrium is also present in *H. edesma*, but, in *H. edesma* the glands are clearly separated from dart sacs. On sight, shell resembles *H. pinicola*, however, Huichapan specimens are smaller, with fewer whorls and with lighter bands, furthermore, *H. pinicola* presents an atrium as long as penis, the epiphallus short and stout, whereas spermathecal duct and spermatheca are very short.

**Etymology:** The type locality is known to the Nahoas people as “Hueychapan,” which means “On the chía water or on the chía river”; the epithet *salviahispanica* derives from *Salvia hispanica*, the scientific name of the chía plant, and is here used as a name in apposition.

*Humboldtiana thompsoni* new species  
(Figures 5–8, 14)

**Diagnosis:** A large shell with almost imperceptible bands, interior of the shell slightly iridescent. The pear-shaped penis and the very long flagellum distinguish it from other members of the *Humboldtiana buffoniana* “species group”.

**Description:** SHELL (Figures 5–8): Shell globose, external lip not reflected, light brown in color; bands lacking in holotype, second and third bands perceptible up

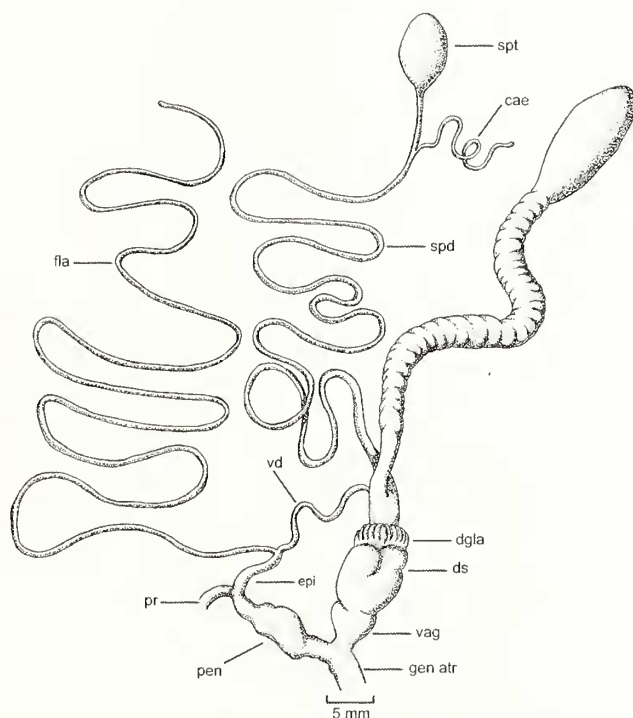


**Figure 13.** Reproductive anatomy of *Humboldtiana salviahispanica* new species, paratype, CNMO 2731. Abbreviations: **cae**, spermathecal caecum; **dgla**, dart glands; **ds**, dart sacs; **epi**, epiphallus; **fla**, flagellum; **gen atr**, genital atrium; **pen**, penis; **pr**, penis retractor; **spd**, spermathecal duct; **spt**, spermatheca; **vag**, vagina; **vd**, vas deferens.

to the third and first tenth of the body whorl in paratype UF376800 and perceptible until the first quarter of the body whorl in the paratype CNMO2732. In holotype, internal shell surface brown with slightly iridescent white patch, in paratype UF376800 internal surface of shell white, slightly iridescent, and in paratype CNMO2732 internal surface of shell white brown. In all specimens there are 4.1 whorls, embryonic shell cream colored with 1.2 whorls (1.25, 1.2), embryonic sculpture consisting of very thin growth lines that increase toward body whorl, with oblong papillae near suture. Rest of shell sculpture consisting of well-marked growth lines, white on a pale-brown background. Granules large, randomly distributed, increasing in size on subsequent whorls. Umbilicus narrow, completely covered by margin in holotype and paratype CNMO2732, and incompletely covered by margin in paratype UF376800.

Thin white callus. Shell height: 42 mm (30, 35); shell diameter: 49 mm (35, 43); aperture height: 35 mm (25, 29); aperture diameter: 34 mm (22, 25).

**REPRODUCTIVE ANATOMY (FIGURE 14):** The following description is based on the holotype and two paratypes. Penis varies from asymmetric pear-shaped to almost globose, measuring 10 mm (6.3, 9.3), interior of the penis with large, cylindrical verge. (Short conical verge in paratype CNMO2732), inner penis with four longitudi-



**Figure 14.** Reproductive anatomy of *Humboldtiana thompsoni* new species, holotype, DP 692. Abbreviations: **cae**, spermathecal caecum; **dgla**, dart glands; **ds**, dart sacs; **epi**, epiphallus; **fla**, flagellum; **gen atr**, genital atrium; **pen**, penis; **pr**, penis retractor; **spd**, spermathecal duct; **spt**, spermatheca; **vag**, vagina; **vd**, vas deferens.

nal folds. Penis retractor muscle 37 mm. Epiphallus short and stout, measuring 5.2 mm (6, 8), vas deferens uniformly slender. Cylindrical atrium, slightly elongated, measuring 4.5 mm (6, 4). Vagina short, cylindrical, measuring 3.3 mm (2.2, 2.3). Four dart sacs of same size, each with one dart, dart bulbs not exposed, measuring 6 mm (4.7, 2.9). Glands short, forming ring just above dart sacs, maximum height 2.7 mm (2.9, 1.7). Spermathecal duct very long, diverging from uterus just above glands, measuring 190 mm (133, 100), with short caecum, measuring 30 mm (13, #). Spermatheca varies from elongated sac-shaped to globose, adhering to anterior end of uterus-prostate, at base of albumen gland, measuring 84 mm (55, 44). Flagellum very long, measuring 232 mm (182, 218), 15.26 (14.79, 12.6) × combined length of penis + epiphallus.

**Type Material:** HOLOTYPE: DP 692; collected 15 April 1990, by Oscar J. Polaco. PARATYPES: UF 376800 (1), CNMO 2732 (1); all from type locality.

**Type Locality:** NUEVO LEÓN: Cañon de Carretas, 11.1 km north and 4.4 km west of San Josecito, 1740 m alt. (24°04'11" N, 99°56'58" W).

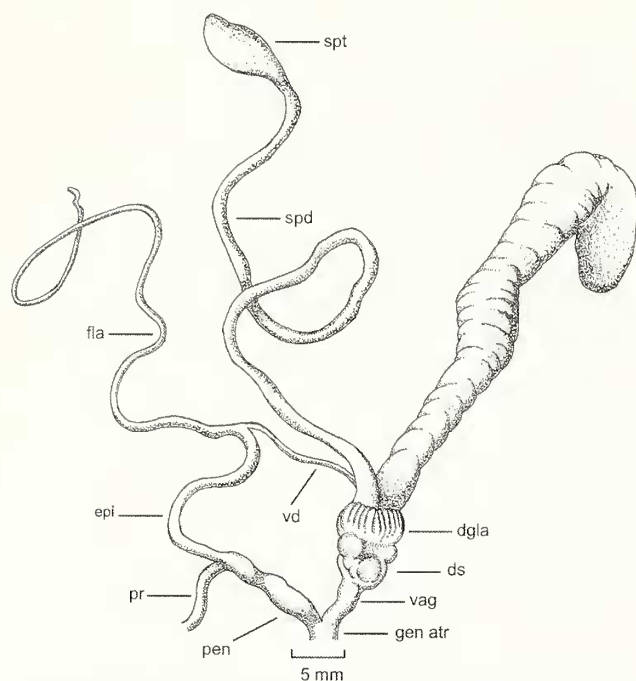
**Remarks:** The presence of four equal-sized dart sacs and the position of the dart glands indicates that this species belongs to the *Humboldtiana buffoniana* "species group." The extremely long flagellum was seen before only in the subgenus *Polyomphala*, although, members of this subgenus are characterized by exposed dart bulbs and depressed shells. The length of the flagellum in *H. thompsoni* is comparable only with that observed in *H. pilsbryi* (354 mm), but in this latter species, penis and epiphallus are cylindrical and the atrium is short and broadened (unpublished data).

**Etymology:** This species is dedicated to Dr. Fred C. Thompson, curator of the Mollusk Collection at the Florida Museum of Natural History, who kindly provided several samples for molecular studies of the genus.

*Humboldtiana ootamorom* new species  
(Figures 9–12, 15)

**Diagnosis:** The brown-golden shell, the dart glands just above the dart sacs and the presence of granular sculpture distinguish the new species from other species of the subgenus *Gymnopallax*.

**Description:** SHELL (FIGURES 9–12): Shell globose, external lip slightly thickened, brown-golden color, with white stains that impart an ash colored tint, with three continuous charcoal to dark-brown bands, slightly perceptible through the shell. Internal shell surface whitish, with 3.8 to 4.3 whorls. Embryonic shell pale brown to caramel color, 1.5 to 1.75 whorls, first whorl without sculpture, then with well-defined growth lines, with fine, uniform, granules that increase in size. Umbilicus completely covered by margin, where granules are less perceptible. Thin to moderate whitish callus. Shell



**Figure 15.** Reproductive anatomy of *Humboldtiana ootamorum* new species, paratype, DP 690. Abbreviations: **dgla**, dart glands; **ds**, dart sacs; **e**pi, epiphallus; **fla**, flagellum; **gen atr**, genital atrium; **pen**, penis; **pr**, penis retractor; **spd**, spermathecal duct; **spt**, spermatheca; **vag**, vagina; **vd**, vas deferens.

height: 36 mm (29, 26); shell diameter: 38 mm (36, 27); aperture height: 28 mm (23, 20); aperture diameter: 29 mm (25, 17).

**REPRODUCTIVE ANATOMY (FIGURE 15):** Penis cylindrical, elongated, slightly expanding toward apex, although in one specimen short and uniformly broadened, measuring 9.75 mm (9, 8.25). Interior of penis with four longitudinal folds, with short and expanded verge that covers almost half of the length of the penis, verge formed by two superimposed tissue folds, one with three digitiform processes, middle process of upper fold longer than others, on lower fold all of same size. Behind verge, inner penis with thick crescent-shaped fold. Epiphallus cylindrical, slightly wider at base, measuring 24.6 mm (25.6, 22.5). Atrium short, measuring 2.4 mm (2.85, 2.25). Vagina tubular, elongated, measuring 5.7 mm (6.15, 4.9). Four dart sacs of approximately equal size, measuring 2.7 mm (3, 2.25), each with two exposed dart bulbs at base. Glands short, measuring 3.75 mm (2.4, 1.95), forming compacted ring just above dart sacs. Spermathecal duct elongated, measuring 87 mm (73, 67.5), spermathecal caecum absent. Spermatheca sac-shaped, adhering to uterus-prostate, measuring 12.75 mm (7.65, 7.95). Flagellum relatively short, measuring 70 mm (52, 39),  $2.03 (1.5, 1.26) \times$  combined length of penis + epiphallus.

**Type Material:** HOLOTYPE: CNMO 1188; collected 15 August, 1998, by George M. Ferguson. PARATYPES: UF 376801 (1), DP 690 (1); all from type locality.

**Type Locality:** SONORA: Mesa el Campanero (=Mesa de Enmedio), Barranca El Salto (West side of Mesa), 2060 m alt., 28°21'20" N, 109°02'05" W.

**Distribution:** An immature specimen that resembles *H. ootamotum* was collected on "Arroyo La Pinoso, 9 km al Este del Puente del río Maicoba, Municipio de Yécora, Sonora, Mexico, 1500 m alt., 28°24'30" N, 108°43'30" W, CNMO 1189, collected 7 August, 2000, by George M. Ferguson", the shell is similar but the individual was not sexually mature, for the aforementioned we exclude this specimen of the description.

**Remarks:** The presence of two bulbs exposed at the base of the dart sacs, the absence of sculpture in the embryonic whorl, and the presence of a long spermathecal allocates this species to the subgenus *Gymnopallax*. It differs from the other species of that subgenus by its granular sculpture. Furthermore, in *Humboldtiana ootamorum* dart glands are just above dart sacs, compared with *Humboldtiana sylvania* and *Humboldtiana cicatricose*, where dart glands are widely separated from the dart sacs.

**Etymology:** The Pimas, early inhabitants of this region of Sonora, called themselves "o-otam," or "people of the river;" this species is named after this ethnical group of Northwest Mexico.

#### ACKNOWLEDGMENTS

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